

NITROGEN, PHOSPHOROUS AND POTASSIUM CONTENTS IN BROCCOLI AS INFLUENCED BY ORGANIC AND INORGANIC NUTRIENTS

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ABSTRACT

An experiment entitled “Nitrogen, phosphorous and potassium contents in broccoli as influenced by organic and inorganic nutrients” was conducted at Network project on Biofertilizer, OUAT, BBSR during the year Rabi 2011-12 and 2012-13. From the experiment it was found out that among ten treatments, the T_{10} i.e. 75% NP+100% K+bio inoculants+VC(5t/ha) proved to be the best on account of nitrogen, phosphorous and potassium content of both curd and plant. The nitrogen content of curd and plant was highest in T_{10} i.e. 60.92 kg/ha and 37.97 kg/ha, the phosphorous content of curd and plant was also highest in T_{10} i.e. 6.99 kg/ha and 6.78 kg/ha. Similarly the potassium content was also highest in curd and plant i.e. 34.36 kg/ha and 23.96 kg/ha respectively.

KEYWORDS : Biofertilizers, Vermicompost, FYM, NPK and Curd

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INTRODUCTION

Broccoli (*Brassica oleracea* var *italica*) belonging to the family Brassicaceae is an important cole crop after cabbage and cauliflower. It is native to Mediterranean region, cultivated in Italy in ancient Roman times. It contains vitamin A (130 times and 22 times higher than cauliflower and cabbage, respectively), thiamin, riboflavin, niacin, vitamin C and minerals like Ca, P, K and Fe. It has a very powerful anti-cancer compound, indole-3-carbinol, which boost DNA repair in cells and appears to block the growth of cancer cells. In India, broccoli is not so popular yet. However, the vegetable is gaining popularity during the last few years among the consumers particularly in and around bigger cities owing to the increased awareness about the nutritional properties as well as palatability. Nutrient management is one of the most important practices for profitable cultivation of any vegetable crop. Brassicas are heavy feeders that can grow on a variety of soils as long as the soils provide adequate nutrients and moisture and are well drained. A healthy soil will have a greater capacity to moderate the uptake of fertilizers and will allow a more balanced uptake of nutrients. Sustainable soil management maintains soil health and productivity by taking care of and increasing the soil organic matter.

MATERIALS AND METHODS

The present experiment entitled “Nitrogen, Phosphorous and potassium content in Broccoli as influenced by organic and inorganic nutrients” was carried out at Network project on Biofertilizer, OUAT, BBSR during the year Rabi 2011-12 and 2012-13 in Randomized block design with 10 treatments replicated thrice. The experimental plot size was length 3m and breadth 2.8 m. Spacing adopted was 50cmX 40 cm. The gross area of the experimentation was 367.92 m². The variety taken for the trial was Puspa (F₁ hybrid, Seminis company). Soil test based fertilizer recommendation was 120:30:60 NPK kg/ha. Bio fertilizers such as Azotobacter,

Azospirillum and PSB were mixed in the ratio of 1:1:1. Besides biofertilizers, FYM and Vermicompost were used @ 10 t/ha and 5 t/ha respectively. The experimental treatments are listed below.

Table 1

| Serial No. | Notation | Treatments |
|------------|-----------------|--|
| 1 | T ₁ | Absolute control |
| 2 | T ₂ | 100% NPK |
| 3 | T ₃ | 100% NPK +100% FYM |
| 4 | T ₄ | 100% NPK + 100% V.C |
| 5 | T ₅ | 100% NPK +50%FYM +50% VC |
| 6 | T ₆ | 100% NPK +50%FYM + 25% VC +25% VC |
| 7 | T ₇ | 100% NPK +50% V.C +50%VC |
| 8 | T ₈ | 100% NPK + 50%V.C +25%VC +25%VC |
| 9 | T ₉ | 75%NP +100% K+ Bioinoculant+100% FYM |
| 10 | T ₁₀ | 75 % NP + 100% K +Bioinoculant+100% VC |

RESULTS AND DISCUSSIONS

In table 1 maximum nitrogen content of the curd was found out in T₁₀ (60.93 kg/ha and 60.91 kg/ha) also that was statistically significant than all other treatments..Similarly, as per Table 2, nitrogen content of the plant was recorded to be highest in T₁₀ (36.20 kg/ha and 39.74 kg/ha) during 2011-12 and 2012-13 respectively. In Table 3 and Table 4, maximum phosphorous content of curd and plant during 2011-12 and 2012-13 was (5.44 kg/ha,7.37 kg/ha and 6.53kg/ha,7.04 kg/ha).In Table 5 potassium content of curd is maximum inT₁₀ during 2011-12 and 2012-13 (33.72 kg/ha and 34.99 kg/ha). Similarly, in Table 6 potassium content of plant was highest in T₁₀ (23.64 kg/ha and 24.27 kg/ha). Combined use of biofertilizer and organic manures increased the productivity of broccoli crop. Chemical fertilizer mainly nitrogen is highly volatile in nature and get leached away. But phosphorous and potassium are gradually available to the plant. Biofertilizer keeps the nutrient in bound form and make it available to the crop. In other words its role is like a chelating agent for all the nutrients excepting nitrogen. The highest values of nitrogen, phosphorous and potassium content of both plant and curd was noticed in T₁₀.The crop responded positively to the direct and residual effect of graded dose of inorganic nutrients integrated with organic and biological sources either alone or mostly together. The individual or synergistically availability of nitrogen, phosphorous and potassium resulted in increased in vegetative growth, thus increase in yield. This corroborates the findings of Evaraats *et al* (2012) in crop broccoli, Sable and Bhamare (2011) in cauliflower, Sharma (2009) in broccoli and Ranwat *et al.* (2014) in broccoli crop.

Table 2: Nitrogen Content of Curd of Broccoli

| Sl. No. | Treatments | N- Content of Curd (Kg/Ha) | | |
|---------|--|----------------------------|---------|--------|
| | | 2011-12 | 2012-13 | Pooled |
| 1 | Absolute control | 2.91 | 3.11 | 3.01 |
| 2 | 100% NPK | 23.38 | 20.96 | 22.17 |
| 3 | 100% NPK +100% FYM | 33.35 | 35.08 | 34.21 |
| 4 | 100% NPK + 100% V.C | 42.03 | 45.97 | 44.00 |
| 5 | 100% NPK +50%FYM +50% VC | 44.01 | 46.43 | 45.25 |
| 6 | 100% NPK +50%FYM + 25% VC +25% VC | 44.30 | 51.48 | 47.88 |
| 7 | 100% NPK +50% V.C +50%VC | 49.77 | 54.67 | 52.22 |
| 8 | 100% NPK + 50%V.C +25%VC +25%VC | 56.07 | 56.24 | 56.16 |
| 9 | 75%NP +100% K+ Bioinoculant+100% FYM | 56.35 | 58.13 | 57.24 |
| 10 | 75 % NP + 100% K +Bioinoculant + 100% VC | 60.93 | 60.91 | 60.92 |
| | SEM± | 0.34 | 0.32 | 0.19 |
| | CD(0.05) | 1.02 | 0.96 | 0.54 |

Table 3: Nitrogen Content of Plant of Broccoli

| Sl. No. | Treatments | N- Content of Plant (Kg/Ha) | | |
|---------|--|-----------------------------|---------|--------|
| | | 2011-12 | 2012-13 | Pooled |
| 1 | Absolute control | 1.29 | 1.07 | 1.19 |
| 2 | 100% NPK | 16.91 | 17.91 | 17.41 |
| 3 | 100% NPK +100% FYM | 18.29 | 20.87 | 19.58 |
| 4 | 100% NPK + 100% V.C | 21.27 | 23.73 | 22.50 |
| 5 | 100% NPK +50%FYM +50% VC | 23.06 | 28.21 | 25.63 |
| 6 | 100% NPK +50%FYM + 25% VC +25% VC | 23.97 | 30.67 | 27.32 |
| 7 | 100% NPK +50% V.C +50% VC | 27.88 | 33.44 | 30.66 |
| 8 | 100% NPK + 50% V.C +25% VC +25% VC | 31.15 | 35.71 | 33.43 |
| 9 | 75%NP +100% K+ Bioinoculant+100% FYM | 34.78 | 37.77 | 36.28 |
| 10 | 75 % NP + 100% K +Bioinoculant + 100% VC | 36.20 | 39.74 | 37.97 |
| | SEM± | 0.36 | 0.39 | 0.44 |
| | CD(0.05) | 1.08 | 1.18 | 1.21 |

Table 4: Phosphorous Content of Curd of Broccoli

| Sl. No. | Treatments | P-Content of Curd (Kg/Ha) | | |
|---------|--|---------------------------|---------|--------|
| | | 2011-12 | 2012-13 | Pooled |
| 1 | Absolute control | 0.23 | 0.34 | 0.29 |
| 2 | 100% NPK | 1.88 | 1.70 | 1.79 |
| 3 | 100% NPK +100% FYM | 2.98 | 3.16 | 3.07 |
| 4 | 100% NPK + 100% V.C | 3.88 | 3.58 | 3.73 |
| 5 | 100% NPK +50%FYM +50% VC | 4.14 | 4.01 | 4.08 |
| 6 | 100% NPK +50%FYM + 25% VC +25% VC | 4.63 | 5.07 | 4.85 |
| 7 | 100% NPK +50% V.C +50% VC | 4.81 | 5.15 | 4.98 |
| 8 | 100% NPK + 50% V.C +25% VC +25% VC | 4.82 | 5.43 | 5.13 |
| 9 | 75% NP + 100% K+ Bioinoculant+100% FYM | 5.78 | 6.04 | 5.91 |
| 10 | 75 % NP + 100% K +Bioinoculant + 100% VC | 5.44 | 7.37 | 6.99 |
| | SEM± | 0.38 | 0.31 | 0.18 |
| | CD(0.05) | 1.12 | 0.92 | 0.53 |

Table 5: Phosphorous Content of Plant of Broccoli

| Sl. No. | Treatments | P-Content of Plant (Kg/Ha) | | |
|---------|--|----------------------------|---------|--------|
| | | 2011-12 | 2012-13 | Pooled |
| 1 | Absolute control | 0.21 | 0.20 | 0.21 |
| 2 | 100% NPK | 2.94 | 1.95 | 2.45 |
| 3 | 100% NPK +100% FYM | 3.17 | 2.73 | 2.95 |
| 4 | 100% NPK + 100% V.C | 3.27 | 3.65 | 3.46 |
| 5 | 100% NPK +50%FYM +50% VC | 4.33 | 4.02 | 4.18 |
| 6 | 100% NPK +50%FYM + 25% VC +25% VC | 4.69 | 4.52 | 4.61 |
| 7 | 100% NPK +50% V.C +50% VC | 5.14 | 5.74 | 5.44 |
| 8 | 100% NPK + 50% V.C +25% VC +25% VC | 5.49 | 6.10 | 5.80 |
| 9 | 75%NP +100% K+ Bioinoculant+100% FYM | 6.12 | 6.62 | 6.37 |
| 10 | 75 % NP + 100% K +Bioinoculant + 100% VC | 6.53 | 7.04 | 6.78 |
| | SEM± | 0.31 | 0.36 | 0.20 |
| | CD(0.05) | 0.92 | 1.09 | 0.56 |

Table 6: Potassium Content of Curd of Broccoli

| Sl. No | Treatments | K-Content of Curd (Kg/Ha) | | |
|--------|---------------------|---------------------------|---------|--------|
| | | 2011-12 | 2012-13 | Pooled |
| 1 | Absolute control | 1.05 | 1.32 | 1.19 |
| 2 | 100% NPK | 10.78 | 12.81 | 11.79 |
| 3 | 100% NPK +100% FYM | 13.16 | 15.12 | 14.14 |
| 4 | 100% NPK + 100% V.C | 17.63 | 21.18 | 19.41 |

| Table 6: Contd., | | | | |
|------------------|--|-------|-------|-------|
| 5 | 100% NPK +50%FYM +50% VC | 18.86 | 21.12 | 19.99 |
| 6 | 100% NPK +50%FYM + 25% VC +25% VC | 23.03 | 24.89 | 23.96 |
| 7 | 100% NPK +50% V.C +50% VC | 25.83 | 26.72 | 26.28 |
| 8 | 100% NPK + 50% V.C +25% VC +25% VC | 29.88 | 32.76 | 31.32 |
| 9 | 75%NP +100% K+ Bioinoculant+100% FYM | 30.79 | 33.97 | 32.38 |
| 10 | 75 % NP + 100% K +Bioinoculant + 100% VC | 33.72 | 34.99 | 34.36 |
| | SEM± | 0.36 | 0.35 | 0.26 |
| | CD(0.05) | 1.07 | 1.04 | 0.73 |

Table 7: Potassium Content of Plant of Broccoli

| Sl. No | Treatments | K-Content of Plant (Kg/Ha) | | |
|--------|--|----------------------------|---------|--------|
| | | 2011-12 | 2012-13 | Pooled |
| 1 | Absolute control | 0.69 | 0.86 | 0.78 |
| 2 | 100% NPK | 9.19 | 8.97 | 9.08 |
| 3 | 100% NPK +100% FYM | 11.45 | 10.37 | 10.91 |
| 4 | 100% NPK + 100% V.C | 12.69 | 13.34 | 13.02 |
| 5 | 100% NPK +50%FYM +50% VC | 13.11 | 14.99 | 14.05 |
| 6 | 100% NPK +50%FYM + 25% VC +25% VC | 14.79 | 15.93 | 15.36 |
| 7 | 100% NPK +50% V.C +50% VC | 17.87 | 20.45 | 19.16 |
| 8 | 100% NPK + 50% V.C +25% VC +25% VC | 18.68 | 19.86 | 19.27 |
| 9 | 75%NP +100% K+ Bioinoculant+100% FYM | 20.14 | 20.91 | 20.53 |
| 10 | 75 % NP + 100% K +Bioinoculant + 100% VC | 23.64 | 24.27 | 23.96 |
| | SEM± | 0.33 | 1.11 | 0.46 |
| | CD(0.05) | 0.99 | 3.29 | 1.29 |

REFERENCES

1. Everaarts A P, Model C P De and Willigen P De. 2012. Nitrogen fertilizing and nutrient uptake of broccoli. PAV Bulletin Vollegrondsgroenteteelt, February, pp: 16-17.
2. Mahmud S, Haider J, Moniruzzaman, M and Islam M R. 2011. Optimization of fertilizer requirement for broccoli under field condition. Bangladesh Journal of Agricultural Research 32(3): 487-491.
3. Ranwat R, Shukla AK and Srolla DK. 2014. Effect of nitrogen, phosphorous and potassium on growth and yield of sprouting broccoli (*Brassica oleracea* var. *italica* Plenck) cv. Hybrid-1. The Horticulture Journal 21(2): 60-61.
4. Singh Rakesh, Chaurasia, S N S and Singh S N. 2010. Response of nutrient sources and spacing on growth and yield of broccoli (*Brassica oleracea* var. *italica* Plenck). Vegetable Science 33(2): 198-200.
5. Sharma K C. 2009. Influence of integrated nutrient management on yield and economics in broccoli (*Brassica oleracea* L. var. *italica* plenck) under cold temperate conditions. Vegetable Science 27(1): 62-63.
6. Sable P B and Bhamare V K. 2011. Effect of biofertilizers (*Azotobacter* and *Azospirillum*) alone and in combination with reduced levels of nitrogen on quality of cauliflower cv. Snowball-16. Asian Journal of Horticulture 2 (1): 215-217.
7. Sanwal, S.K. and Yadav, D.S. 2015. Broccoli-A highly nutritive and profitable crop. Intensive Agriculture May-June 36: 28-29.
8. Schuphan, W. 2012. Nutritional value of crops as influenced by organic and inorganic fertilizer treatment. Results of 12 years experiments with vegetables (1960-1972). Qual, Plant-P.L. Fds Hum. Nutr., 23(4):333-358.